Percussion Cap and Fuse and Ordnance Piece

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Continuation of application Ser. No. 326,742, Nov. 29, 1963. This application Jan. 9, 1967, Ser. No. 608,225

Claims priority, application Germany, Nov. 29, 1962, D 40,378

5 Claims. (Cl. 102—86.5)

ABSTRACT OF THE DISCLOSURE

An ordnance piece such as a mortar shell is provided with a percussion cap having a bore characterized by including a length of large diameter, a length of small diameter and a ledged bore connecting said lengths. A charge is compacted in the bore and extends into the length of large diameter.

This application is a continuation of application Ser. No. 326,742 filed Nov. 29, 1963, now abandoned.

Commonly, percussion caps of the prior art comprise a thin walled plastic capsule filled with the priming charge, having a floor with or without a striker hole that is covered by a thin foil. The discharge opening is generally covered by a thin disk held on by crimping the edge of the capsule. Due to its slight wall thickness, the percussion cap is sensitive to mechanical stresses which are unavoidable during installation. The operation of applying the cover disk by crimping is also a delicate one. This delicate character is only one of the disadvantages of the percussion caps of the prior art. Another important disadvantage lies in the fact that the priming charge is unsupportive. When the shell is fired from the gun for explosion on subsequent impact, a force resulting from the inertia of the priming charge works upon the latter in the direction of the discharge opening and threatens to shift the priming charge within the percussion cap. If such a shift occurs, it can lead to faulty operation of the shell. Further, it is also objectionable that, when the shell strikes the target, even a slight bending of the fuse head can deflect the striker, so that, in the case of percussion caps with an opening for receiving a striking, the centering may be lost under certain circumstances.

The principal object of the invention is the provision of a fuse in which the above-mentioned disadvantages are avoided. According to the invention a thick walled, turned or pressed cylindrical metal body serves to receive the priming charge, and has a ledged bore that narrows towards the discharge side, the ledge of the said bore serving as a supporting surface for the priming charge that is pressed into the said bore. The replacement of the thin walled shell with a thick walled cylindrical body gives increased strength to the percussion cap, so that deformation during installation and when the shell strikes the target no longer needs to be feared. The supporting surface which is created by the ledged bore securely prevents the priming charge from shifting within the cap.

The new construction furthermore permits a design in which any eccentricity between the striker and the percussion cap that may develop in practice becomes harmless in that the diameter of the bore of the striker side can be made approximately 2—5 times as great as the diameter of the striker. Even in the event of considerable axial deviation, proper firing is assured. Such proportioning provides suitable clearance.

It is true that, with this construction, it cannot be avoided that a portion of the priming flame will flash back to the striker. This flash back, however, can be limited to a great extent by giving the striker cross-section a favorable ratio to the cross-section of the discharge hole, say 1:0.5 to 1:2, i.e. a suitable fit is provided by making the diameter of the discharge hole about 0.5—2 times the diameter of the striker. The striker preferably blocks the discharge hole. It is expedient to shape the bore in the manner of a valve seat, so that the point of the striker will become seated on it like a beveled valve head. A further shielding from the discharge side can be achieved by a collar-like projection on the striker, which applies itself blockingly against the passage leading to the discharge side.

The depth of the charge in the strike hole is to be such that the striker produces good ignition with the least possible energy. A charge depth of 0.5 to 1.5 mm. is recommended.

Under certain circumstances a heavier priming charge may be required. This requirement can be met in the case of percussion caps not subject to shock (used for example in land mines). If, according to the invention, the narrowed discharge bore leads on into an expanded bore, which can then receive a correspondingly larger priming charge. The percussion cap can in this case be constructed symmetrically, i.e., with two relatively large bores at both ends and a restricted connecting passage. In this design the percussion cap can be installed with either end up.

The percussion cap of the invention is suitable for use in ordnance pieces including shells, bombs, fuses, and the like.

Thus, the invention provides an ordnance piece comprising a case, a charge in the casing, and a percussion cap mounted for ignition of the charge. The piece can include a striker for operation of the percussion cap. The percussion cap comprises an elongated casing having a bore extending therethrough, and this bore includes a length of relatively large cross-sectional area, a length of relatively small cross-sectional area, and a ledge intermediate the bore lengths. A percussion cap charge, as is known in the art, can be contained within the cap.

The invention is further described with reference to the embodiment shown in the accompanying drawing, wherein:

FIG. 1 and FIG. 2 are cross-section, elevation views of two percussion caps according to the invention;

FIG. 3 is a cross-section, elevation view of a percussion cap according to the invention and showing a further modification of the construction;

FIG. 4 is a view corresponding to the showing in FIG. 3 but indicating the condition of the percussion cap during the striking thereof; and

FIG. 5 is a view of a portion of an ordnance piece outfitted with a percussion cap according to the invention, the showing being in elevation and in cross-section.

In FIG. 1, I designates the body of the percussion cap, which is made thick walled according to the invention by turning or pressing, 4 is the striker, 2 the primer charge, and 3 a thin foil covering it. According to the invention bore 5 on the striker side is of relatively large cross-sectional area providing the enlarged portion 5a, and on the discharge side is of relatively small cross-sectional area providing the reduced portion 5b. The enlarged and reduced portions are joined by a ledge 6. The ledge 6 is not at a right angle to the wall of the bore, but diverges from the reduced portion 7. The priming charge 2 is supported against the ledge. In the example shown the diameter of the striker 4 is somewhat smaller than the diameter of discharge hole 7. It can also be somewhat larger than this diameter. In any case, the flash of the priming charge is largely blocked by striker 4 after the latter has fired it.

The embodiment in FIG. 2 is substantially the same.
as the one in FIG. 1, except that here the diameter of the striker 4 is substantially smaller than the diameter of passage 7. To this end an annular collar 8 is provided on striker 4, which is positioned and proportioned to engage the ledge 6, and to a great extent blocks the discharge passage 7 after firing. In this case the priming charge consists of two partial charges 2 and 9, charge 9 being especially adapted to the circumstances of the priming function.

As is indicated in FIG. 2, the enlargement of the bore 2 accommodates off center position of the striker with respect to the bore.

The ratio of the diameter of the discharge hole 7 to the striker 4 can be in the range of about 1:0.5 to 1:2. The outside diameter of the body part 1 can be 4 mm., or in the range of about 4-8 mm.; the height of the charge of percussion or priming material 2 can be 0.5-2.5 mm., for example 0.5-1.5 mm. for a cap with an outside diameter of 4 mm. For a brass containing 60% zinc, the diameter of the discharge hole 7 can be about 1-1.5 mm. and the wall thickness of this section can be 1.25-1.50 mm. The wall thickness of the enlarged part of the bore can be substantially less but is preferably not less than 3/10 of the outside diameter of the body part 1. For stronger material, thickness can be reduced provided stability of the ignition means is preserved.

The charge 2 is compacted, for example by compression of 2000-3000 kg/cm², so that the particles adhere together.

FIGURES 3 and 4 show, in two different states, a percussion cap whose passage is enlarged both on the striker side and on the discharge side. Thus, the lengths of large area are provided, one on either side of the length of small area. The two large bores are connected to one another by the restricted passage 7, with ledges 6 and 6' on either side. The cross-sections of the enlarged length portions are the same, and the priming charge is symmetrically constructed so that it can be installed with either end up.

The diameter of the striker is such that when it fires the priming charge it can rest against the taper of ledge 6 and thus substantially shields off the striker side. FIG. 4 shows the primer during the firing. The ledge 6 disposed adjacent the striker 4 diverges from the length 7, which is of relatively small cross-sectional area, to the length 5a which is of relatively large cross-sectional area, and the striker 4 has a pointed end portion 4a providing a tip for receipt in the small bore 7, and further the end portion has a rear portion for seating on the ledge 6.

Where two charge compositions are used as in FIG. 2, the composition 2 can be a percussion or primer composition, and the composition 9 can be a delay or expeller composition. The two compositions can be as follows—

Percussion charge:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-(5'tetrazolyl)-4-guanyl-tetrazene-hydrate</td>
<td>7</td>
</tr>
<tr>
<td>Lead trinitro resorcinate</td>
<td>30</td>
</tr>
<tr>
<td>Potassium chloride</td>
<td>20</td>
</tr>
<tr>
<td>Sulfur antimony</td>
<td>10</td>
</tr>
<tr>
<td>Quartz powder</td>
<td>33</td>
</tr>
</tbody>
</table>

Expeller charge:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead trinitro resorcinate</td>
<td>65</td>
</tr>
<tr>
<td>Calcium silicate</td>
<td>15</td>
</tr>
<tr>
<td>Barium nitrate</td>
<td>20</td>
</tr>
</tbody>
</table>

A cap as is shown in FIG. 3, containing a single composition has the advantage of being adaptable to insertion either end first. The composition can be as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-(5’tetrazolyl)-4-guanyl-tetrazene-hydrate</td>
<td>5</td>
</tr>
</tbody>
</table>

In FIG. 5, an ordnance piece comprising a casing 11 contains an explosive composition or delay composition 13 housed in inner sleeve 12, and a percussion cap 14, according to the invention, is positioned at the end of the charge 12, in known manner. The ordnance piece also includes a striker 15 for operation of the percussion cap in known manner.

While the invention has been described with respect to particular embodiments thereof, these embodiments are merely representative and do not serve to define the limits of the invention.

What is claimed is:

1. Ordnance piece comprising a percussion cap having an elongated casing having a bore extending therethrough, said bore including a length of relatively large cross-sectional area, a length of relatively small cross-sectional area and a ledged bore intermediate said lengths diverging from the length of small area to the length of large area, and percussion cap charge composed of particles compacted in said bore so that the particles adhere together, said charge filling the ledge bore and extending therefrom into the length of large cross-sectional area and the length of small cross-sectional area, said piece further comprising a charge for ignition by the cap, the cap being disposed adjacent one end of the charge with the length of relatively large cross-sectional area disposed outwardly from the charge.

2. Combination according to claim 1, and a striker for said cap mounted for striking the cap upon actuation thereof, the striker having a pointed end portion providing a tip for receipt in the length of small cross-sectional area and a rear portion of said end portion for seating on said ledge.

3. Combination according to claim 1, and a striker for said cap mounted for striking the cap upon actuation thereof, the striker having a capular spaced from the striking end thereof for engagement of said ledge for preventing flash-back upon operation of the percussion cap.

4. Percussion cap according to claim 1, said bore including a second length of relatively large cross-sectional area, said second length being disposed across the length of small area from the first-mentioned length of relatively large area, the construction of the cap being symmetrical with respect to the length of relatively small cross-sectional area permitting installation of the percussion cap in the ordnance piece either end first.

5. Ordnance piece according to claim 1, the diameter of the length of relatively large cross-section being about 2-5 times the diameter of the striker.

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U.S. Cl. X.R.

102—29